

Bowls and Cones

- 1) Jonathan delivers pizza several nights a week. Every night he works he gets a free pizza. He always brings home a 2-topping pizza with two different toppings of pineapple, sausage, mushrooms, onions, or anchovies. How many nights can he work without repeating a combination?
- 2) Jonathan's sister Johanna also works at the same pizza parlor and she always brings home a 3-topping pizza with three different toppings. If she likes the same 5 flavors as her brother, how many nights can she work without repeating a combination?
- 3) As a special promotion, the pizzeria that Jonathan works at adds two new toppings, Canadian bacon and ham. Now how many different pizzas can Jonathan and Johanna order?
- 4) After Jonathan finishes delivering pizza, he always treats himself to a two-scoop bowl of ice cream at the ice cream shop next to the pizza parlor. If the ice cream shop has 24 flavors, how many different combinations of two scoops of ice cream can Jonathan create? (He always insists on getting two different flavors for his two scoops.)
- 5) Next, Johanna enters the scene. She likes her ice cream on a cone, and it's important to her which scoop is on top. After all, she says, eating chocolate and then vanilla is a different taste experience than eating vanilla and then chocolate. Like her brother, she always wants two different flavors. How many different two-scoop cones can Johanna make?
- 6) On an evening that Johanna wasn't working she asked Jonathan to pick her up a special three-scoop cone on his way home from the pizza parlor. She wanted Chocolate, Vanilla, and Strawberry on her cone. Unfortunately she did not tell Jonathan the order she wanted. Not wanting to make her unhappy, he decided to get all possible cones with those three flavors. How many different cones would he have to get?
- 7) Jonathan realized he was lucky that Johanna had not wanted a 4-scoop cone. If she had, how many cones would he have had to buy?
- 8) After having that one 3-scoop cone, Johanna decided that she would not only eat 3-scoop cones from now on, but that she also wanted to try every possible 3-scoop combination. How many different cones could she get if the shop had 24 flavors and she always had three different flavors on each cone?
- 9) Suppose that Johanna wanted to try every possible 4-scoop cone. How many different cones could she get then?

A.N.8: Permutations 1: Determine the number of possible arrangements (permutations) of a list of items

- 1 The bowling team at Lincoln High School must choose a president, vice president, and secretary. If the team has 10 members, which expression could be used to determine the number of ways the officers could be chosen?
- 2 John is going to line up his four golf trophies on a shelf in his bedroom. How many different possible arrangements can he make?
 - 1) 24
 - 2) 16
 - 3) 10
 - 4) 4
- 3 How many different three-letter arrangements can be formed using the letters in the word *ABSOLUTE* if each letter is used only once?
 - 1) 56
 - 2) 112
 - 3) 168
 - 4) 336
- 4 How many different four-letter arrangements are possible with the letters *G, A, R, D, E, N* if each letter may be used only once?
 - 1) 15
 - 2) 24
 - 3) 360
 - 4) 720
- 5 Determine how many three-letter arrangements are possible with the letters *A, N, G, L, and E* if no letter may be repeated.
- 6 A password consists of three digits, 0 through 9, followed by three letters from an alphabet having 26 letters. If repetition of digits is allowed, but repetition of letters is not allowed, determine the number of different passwords that can be made. If repetition is not allowed for digits or letters, determine how many fewer different passwords can be made.